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## Measuring wage inequality within and across U.S. metropolitan areas, 2003–13

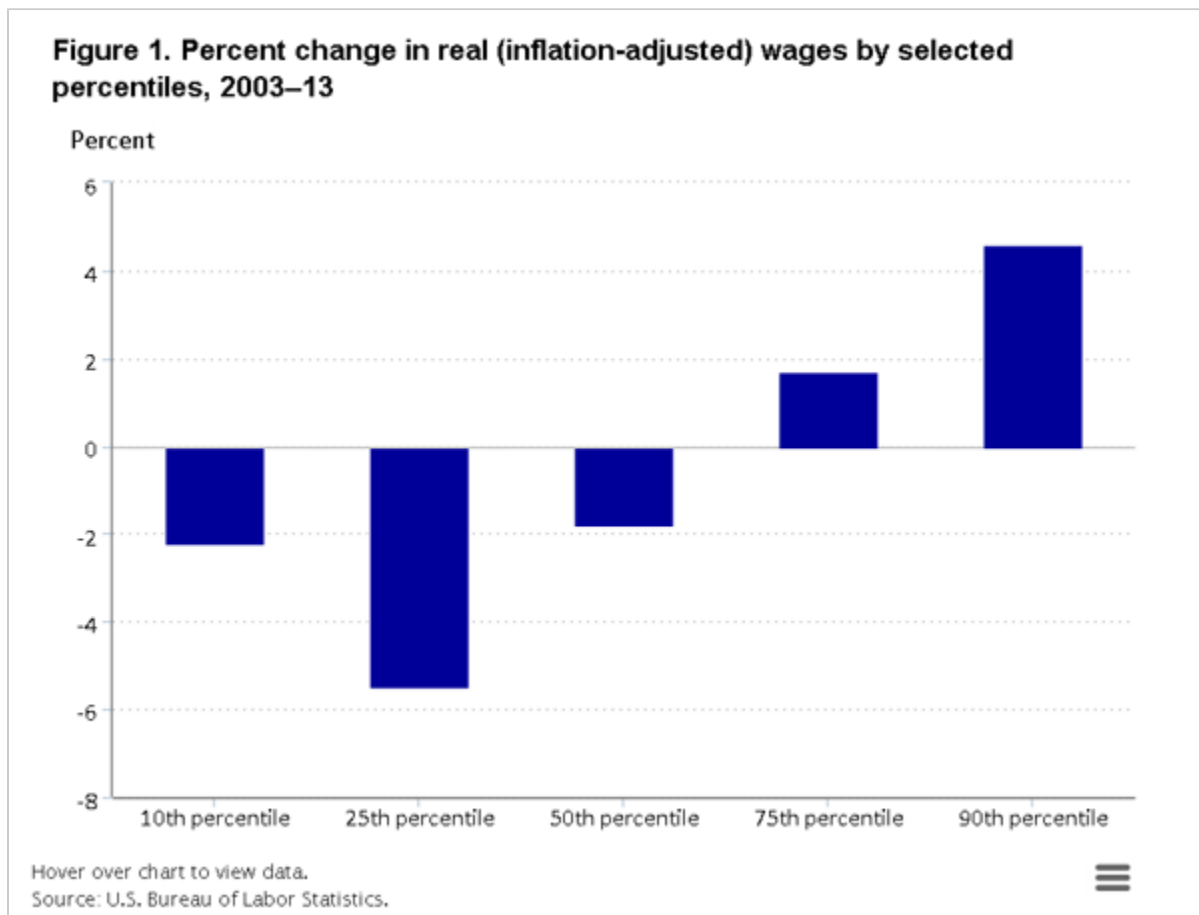
*This article shows that location, size, and occupational composition play important roles in determining the level of wage inequality within and across U.S. metropolitan areas. Larger areas, especially in the Northeast and on the West Coast, typically have greater wage inequality, while smaller areas, many of which are in the South and Midwest, have less inequality. Metropolitan areas with high concentrations of employment in higher paying occupations also tend to have greater inequality.*

Rising wage inequality in recent years has brought increased focus on the disparity between the highest wage earners and the lowest wage earners. Less attention, however, has been paid to how wage inequality varies by location or area. By one measure—the ratio of the 90th wage percentile to the 10th wage percentile, sometimes called the “90–10” ratio, inequality increased by 7 percent in the United States between 2003 and 2013. But this increase varied widely by area. The 90–10 ratio increased by over 20 percent in Oakland, CA, and Corvallis, OR, for example, while it declined in several other metropolitan areas in the United States, including three areas in Florida. This article examines how wage inequality varies by metropolitan area and how average wages, occupational composition, geographic location, and the size of the area contribute to the variation in this inequality measure.

The data used in this article are from the Occupational Employment Statistics (OES) program. The OES program produces employment and wage estimates annually for more than 800 occupations. These data are available for the nation as a whole, for individual states, and for metropolitan and nonmetropolitan areas; national occupational employment and wages for specific industries are also available. The most recent data show that the 90th-percentile annual wage in the United States for all occupations combined was \$88,330 in 2013, and the 10th-percentile wage was \$18,190. In other words, the highest paid 10 percent of wage earners in the United States earned at least \$88,330 per year, while the lowest paid 10 percent earned less than \$18,190 per year. Therefore, by this measure, the “90–10” ratio in the United States was 4.86 in 2013, compared with 4.54 in 2003, an increase of about 7 percent over that 10-year period.

Differences in the 90–10 ratio over time or geography can be due to several factors. They may result from differences in wages for the highest paid workers, the lowest paid workers, or both groups. Differences in the 90th and 10th wage percentiles may also be the result of differences in wage levels within the same occupations, differences in the occupational makeup of the area or areas, or some combination of both. Finally, changes in wage inequality may be because the wages of the highest paid 10 percent of workers (those with wages at or above the 90th percentile) grew faster than those of the lowest paid 10 percent (those whose wages fall below the 10th percentile). In fact, between 2003 and 2013, after adjusting for inflation, the 90th-percentile wage increased 4.6 percent while the 10th-percentile wage decreased 2.2 percent. Figure 1 shows the change in real annual wages at the national level for the 10th, 25th, 50th (median), 75th, and 90th percentiles over the 2003–13 period. As can be seen in the figure, in general, real annual wages increased for the highest paid workers and decreased for the lowest paid workers, a pattern that holds for most metropolitan areas. Nominal wages for both measures increased, but the 90th percentile grew faster than the 10th percentile. This pattern holds for

most, but not all metropolitan areas. The remainder of this article examines nominal wages by metropolitan area.



### Wage inequality by metropolitan area

Wage inequality varies considerably by metropolitan area. For example, San Jose-Sunnyvale-Santa Clara, CA, had the largest 90–10 ratio, at 7.14, while Morristown, TN, had the lowest ratio, at 3.28. Figure 2 shows how the 90–10 ratio varies by metropolitan statistical area (MSA). The largest 90–10 ratios are concentrated in the northeastern United States and along the West Coast, while the smallest ratios are found along the nation’s southern tier, throughout the Midwest, and in the Rocky Mountain states. However, there are exceptions to the overall pattern. The South, for example, is home to metropolitan areas with some of the smallest 90–10 ratios, but it also has areas with exceptionally large ratios.

**Figure 2. Ratio of 90th- to 10th-wage percentiles, by metropolitan statistical area, 2013**

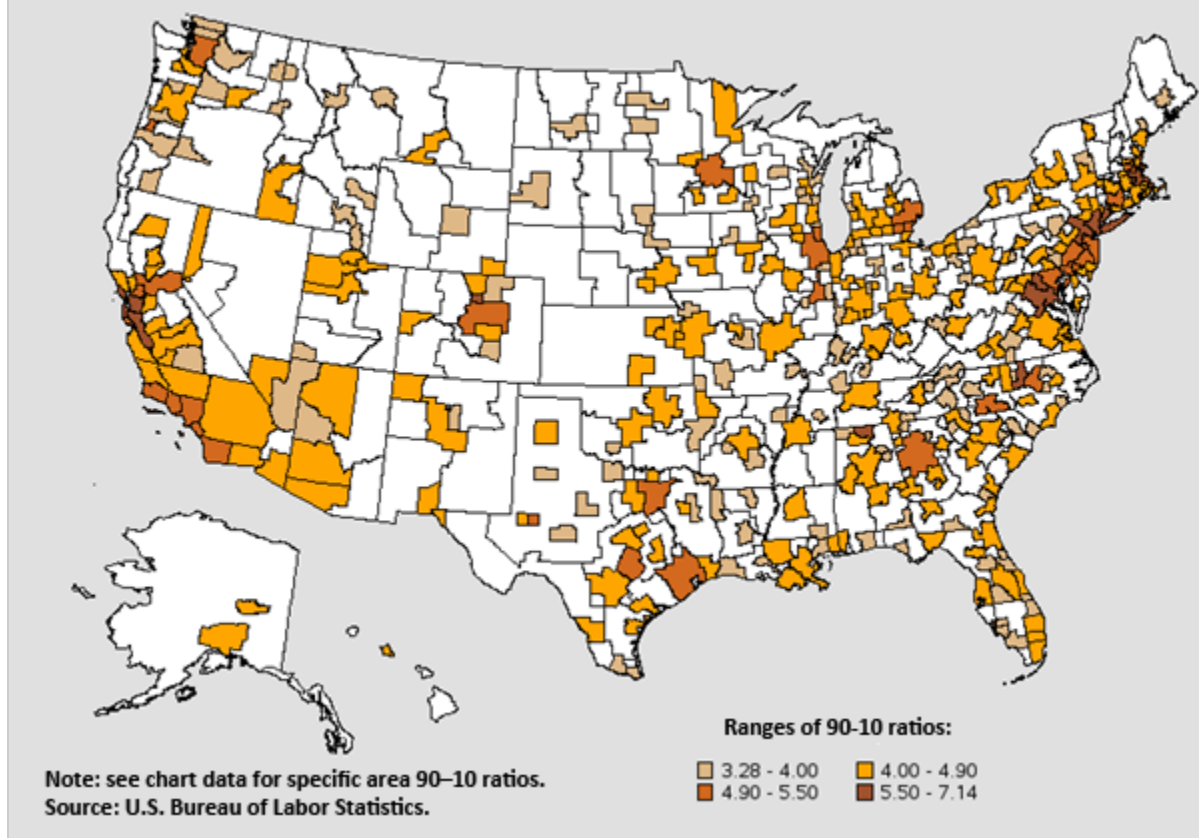


Table 1 shows the U.S. Census regions, the number of metropolitan areas in those regions, and the range of 90–10 ratios found there. More than 20 percent of the metropolitan statistical areas in the Northeast region and its regional divisions had above-average 90–10 wage ratios in 2013. In addition, the lowest 90–10 ratios across the Northeast were higher than the lowest ratios across the other three regions and their divisions. The West also had a relatively high percentage of metropolitan areas with above-average 90–10 ratios (18.1 percent), most of which were in the Pacific division, where 13 of the 15 MSAs with above-average ratios were located. By contrast, the Midwest and the South regions had fewer metropolitan areas with above-average 90–10 ratios. Across the Midwest’s 96 metropolitan areas, only 7 had above-average 90–10 ratios, the highest being 5.18. The South had a few metropolitan areas with ratios above 6.0, but it also had the areas with the lowest 90–10 ratios in the country.

**Table 1. Ratio of 90th- to 10th-wage percentile by geographic regions comprising U.S. metropolitan statistical areas, 2013**

Region	Number of MSAs	Average 90–10 ratio	Highest 90–10 ratio	Lowest 90–10 ratio	Number of MSAs above average	Percent of MSAs above average
Northeast	63	4.56	6.28	3.61	14	22.2
New England	29	4.65	6.00	3.61	7	24.1
Middle Atlantic	34	4.49	6.28	3.69	7	20.6
Midwest	96	4.16	5.18	3.51	7	7.3

Region	Number of MSAs	Average 90–10 ratio	Highest 90–10 ratio	Lowest 90–10 ratio	Number of MSAs above average	Percent of MSAs above average
East North Central	64	4.20	5.18	3.54	6	9.4
West North Central	32	4.08	5.03	3.51	1	3.1
South	153	4.13	6.77	3.28	13	8.5
South Atlantic	80	4.18	6.77	3.35	8	10.0
East South Central	30	4.01	6.16	3.28	1	3.3
West South Central	43	4.11	5.47	3.42	4	9.3
West	83	4.40	7.14	3.49	15	18.1
Mountain	35	4.16	5.68	3.49	2	5.7
Pacific	48	4.58	7.14	3.53	13	27.1

Note: The New England Division includes Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont. The Middle Atlantic Division includes New Jersey, New York, and Pennsylvania. The East North Central Division includes Illinois, Indiana, Michigan, Ohio, and Wisconsin. The West North Central Division includes Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, and South Dakota. The South Atlantic Division includes Delaware, District of Columbia, Florida, Georgia, Maryland, North Carolina, South Carolina, Virginia, and West Virginia. The East South Central Division includes Alabama, Kentucky, Mississippi, and Tennessee. The West South Central Division includes Arkansas, Louisiana, Oklahoma, and Texas. The Mountain Division includes Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, and Wyoming. The Pacific Division includes Alaska, California, Hawaii, Oregon, and Washington. Source: U.S. Bureau of Labor Statistics.

## Wage inequality by size of metropolitan area

In addition to being concentrated in the Northeast and on the West Coast, metropolitan areas with the highest 90–10 ratios tend to be the larger areas, including the Washington, New York, San Francisco, and Oakland metropolitan areas, although there are some exceptions. Figure 3 shows a simple scatter plot of the 90–10 ratio relative to the size of the area as measured by employment for all occupations in that area. The upward-sloping trend line indicates that larger areas tend to have higher 90–10 ratios.

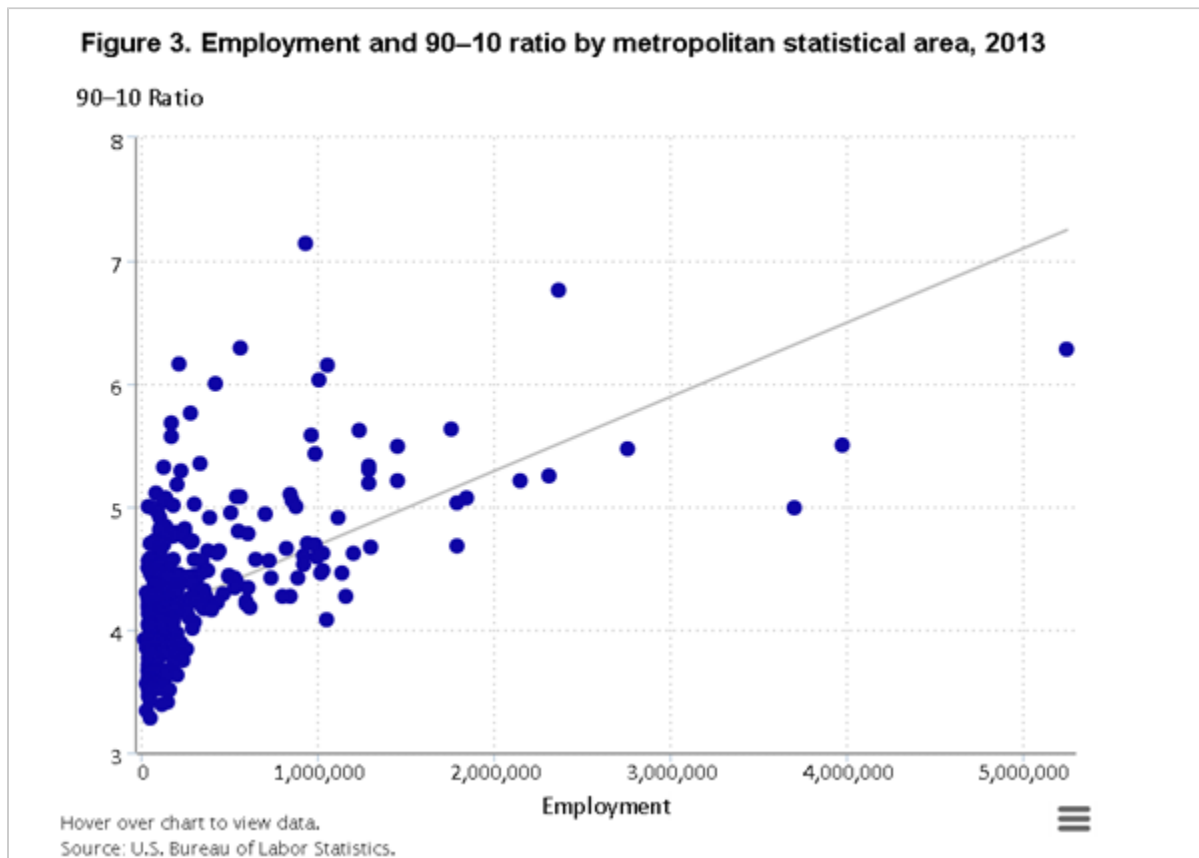


Table 2 shows the share of metropolitan statistical areas with above-average ratios, by size. As the size categories get smaller, so does the percentage of areas with above-average 90–10 ratios. But table 2 also shows that there are several exceptions. In the largest size category, for example, roughly one-third of the areas have below-average 90–10 ratios. At the same time, in the smallest size category (employment of less than 100,000), there were five areas with above-average 90–10 ratios.

**Table 2. Percentage of MSAs with above-average 90–10 ratios by size category**

Total employment	Number of MSAs	Number of MSAs with 90–10 ratio above 4.86	Percent of MSAs with 90–10 ratio above 4.86
1,000,000 or more	28	19	67.9
500,000 to 999,999	32	11	34.4
100,000 to 499,999	144	14	9.7
Less than 100,000	191	5	2.6

Source: U.S. Bureau of Labor Statistics.

The five small MSAs with 90–10 ratios above 4.86 and the nine large MSAs with 90–10 ratios below 4.86 are shown in table 3. Aside from being small, the five MSAs with above-average 90–10 ratios have little else in common. All are located in separate states and at least several hundred miles apart. Santa Cruz-Watsonville is close to other areas with high 90–10 ratios, such as San Jose-Sunnyvale-Santa Clara, San Francisco, and Oakland; but Midland, TX, is several hundred miles away from the nearest area with an above-average 90–10 ratio. The closest large metropolitan area to Corvallis, OR, is Portland-Vancouver-Hillsboro, but it is one of the large areas with below-average inequality.

Figure 4 helps isolate the patterns in inequality across MSA sizes, which can be caused by differences in either the 90th-percentile wages or the 10th-percentile wages. As can be seen in figure 4, the 10th-percentile wage varies little across the size groups while the 90th-percentile wage varies considerably, with higher wages for the larger areas and lower wages for the smaller ones. Thus, the main reason for the higher 90–10 ratios in the larger areas is that the 90th-percentile wage is higher in those areas. In other words, the highest paid workers in the large areas generally earn more than the highest paid workers in the smaller areas, whereas the wages of the lowest paid workers vary less between large and small areas.

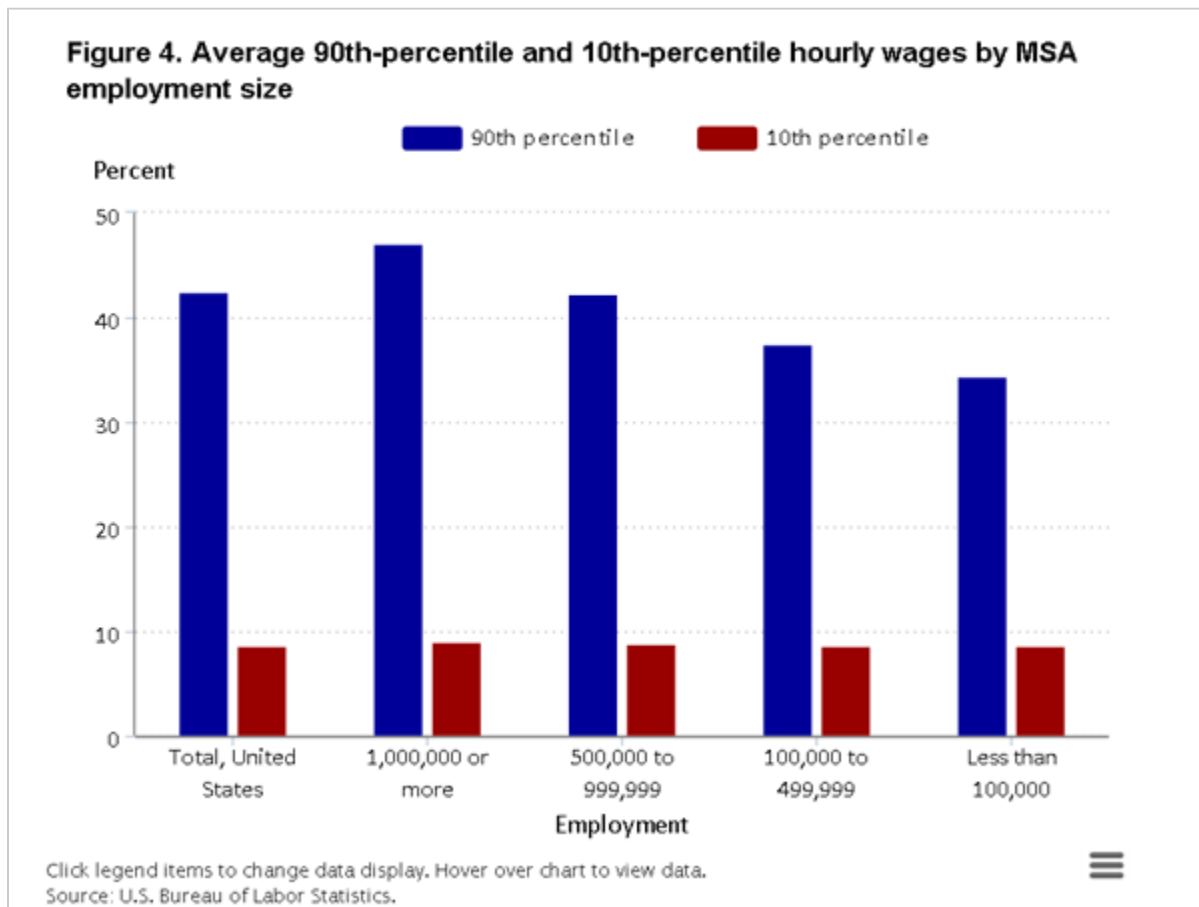


Table 3 shows the exceptions to what is shown in figure 4. Although Midland, TX, is small, and its 10th-percentile wage (\$8.69) is close to average for its size, its 90th-percentile wage is \$44.44, which is higher than the 90th-percentile wage nationally and higher than the 90th-percentile wage for the second largest MSA size category. Portland-Vancouver-Hillsboro, part of the largest MSA size category, has a

90th-percentile wage of \$44.08, about \$3 below the average for that size category, and its 10th-percentile wage is \$9.54, considerably higher than the average among the largest MSAs.

**Table 3. Small MSAs with above-average 90–10 ratios and large MSAs with below-average 90–10 ratios**

Metropolitan Statistical Area	Total employment	90–10 ratio
Midland, TX	82,750	5.11
Corvallis, OR	33,080	5.00
Portsmouth, NH-ME	56,470	4.99
Santa Cruz-Watsonville, CA	85,420	4.95
Champaign-Urbana, IL	96,350	4.91
Phoenix-Mesa-Glendale, AZ	1,781,210	4.68
St. Louis, MO-IL	1,291,420	4.67
Portland-Vancouver-Hillsboro, OR-WA	1,027,440	4.62
Riverside-San Bernardino-Ontario, CA	1,201,500	4.62
Miami-Miami Beach-Kendall, FL	1,023,360	4.48
Pittsburgh, PA	1,130,750	4.46
Cleveland-Elyria-Mentor, OH	1,010,190	4.46
Tampa-St. Petersburg-Clearwater, FL	1,151,890	4.27
Orlando-Kissimmee-Sanford, FL	1,042,150	4.08

Source: U.S. Bureau of Labor Statistics.

Figures 5 and 6 show how the 90–10 ratios for a subset of metropolitan areas changed over the 2003–13 period.<sup>1</sup> Figure 5 shows the percent change in the ratio itself, while figure 6 shows the percent change in the 90th- and 10th-percentile wage values. As can be seen in figure 5, the 90–10 ratio increased for all MSA size categories over the period, but it increased much more in the larger areas (those with employment of 1 million or more).

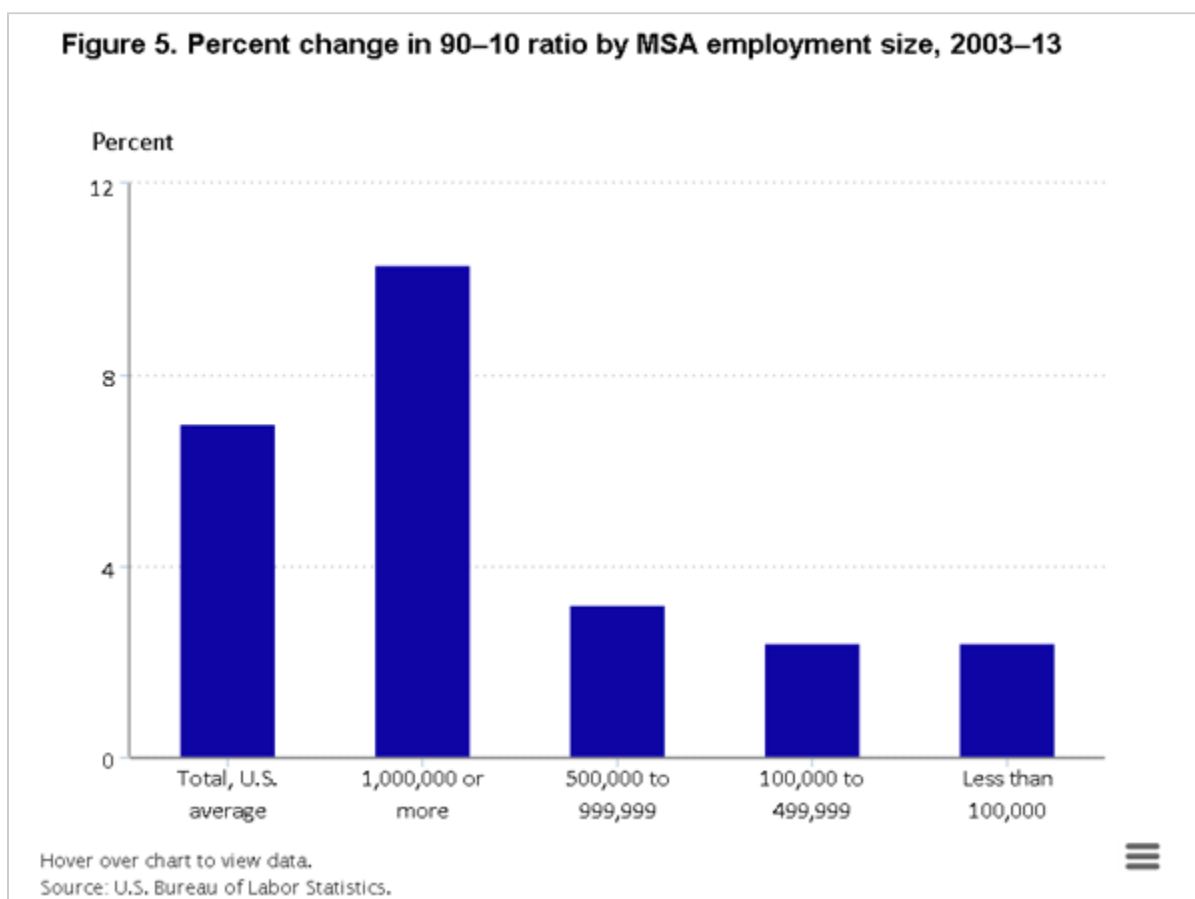
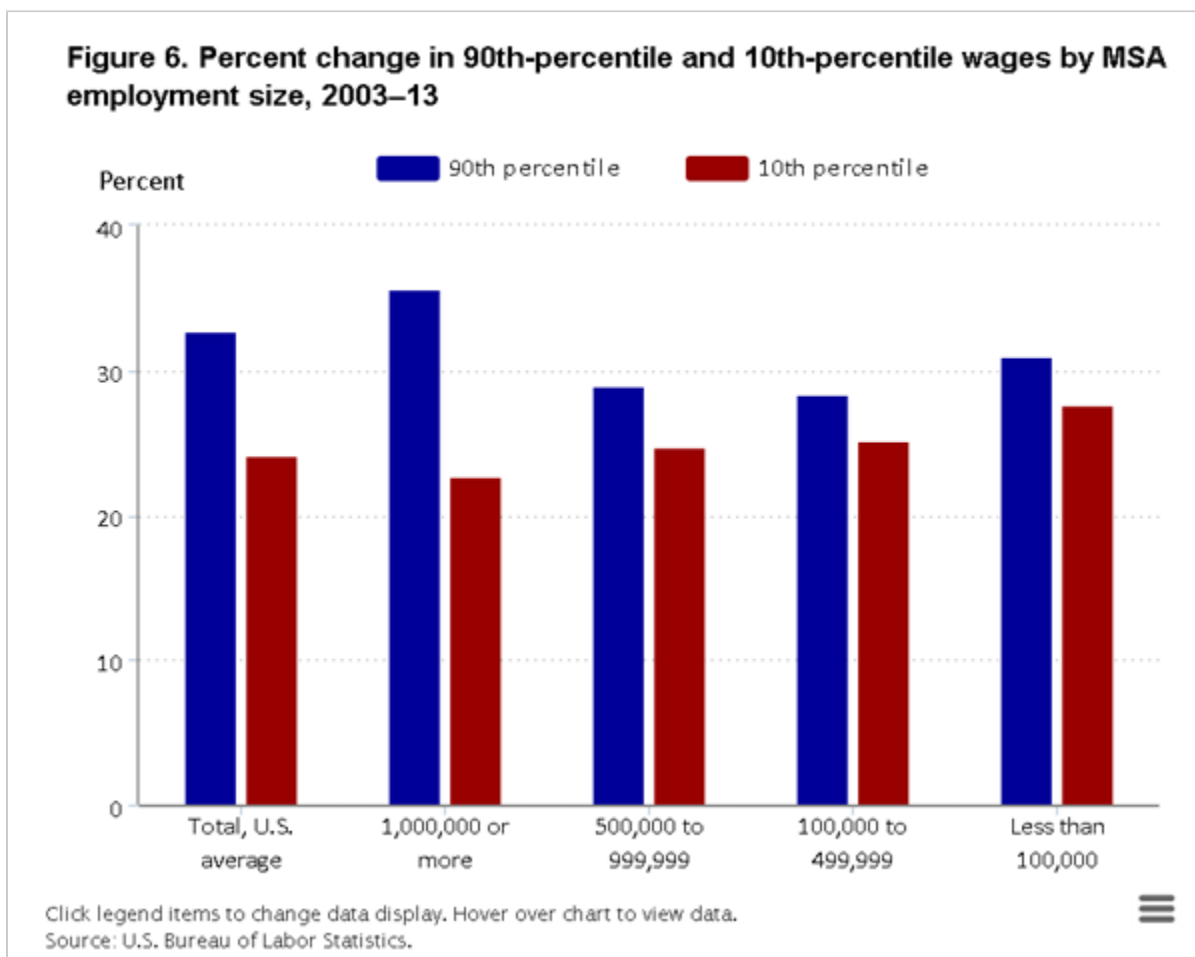


Figure 6 shows that for each size category, the 90th-percentile wage grew faster than the 10th-percentile wage. The figure also shows that the 90th-percentile wages in the smaller areas grew faster than those in the two middle size categories, but the 10th-percentile wages also grew faster in the smaller areas, which helps explain why the 90–10 ratios grew more slowly in the smaller areas than in the larger areas.





## Occupational makeup

The occupational composition of a particular metropolitan area can influence its 90–10 ratio. Generally speaking, greater-than-average shares of employment in either very high-paying or very low-paying occupations can increase the ratio. In fact, areas with high concentrations of high-paying occupations, such as computer and mathematical occupations, tend to have greater wage inequality (as measured by their 90–10 ratios). Table 4 shows the 22 major occupational groups and their 90th-percentile wages in May 2013. The table shows that 8 of the 22 occupation groups have 90th-percentile wages above the 90th-percentile wage for all occupations: management, business and financial operations, computer and mathematical, architecture and engineering; life, physical, and social science; legal; arts, design, entertainment, sports, and media; and healthcare practitioners and technical. Areas with high percentages of these occupations often have relatively high 90–10 ratios.

**Table 4. Share of all-occupations employment, 90th-percentile wage, and mean wage, by major occupational group, United States, May 2013**

Major occupational group	Employment	Percent of total employment	90th-percentile wage
All occupations	132,588,810	100.0	\$88,330
Management occupations	6,542,950	4.9	187,199

Major occupational group	Employment	Percent of total employment	90th-percentile wage
Business and financial operations occupations	6,658,090	5.0	113,650
Computer and mathematical occupations	3,696,180	2.8	130,600
Architecture and engineering occupations	2,380,840	1.8	126,250
Life, physical, and social science occupations	1,135,030	0.9	116,280
Community and social service occupations	1,901,730	1.4	72,290
Legal occupations	1,041,700	0.8	187,199
Education, training, and library occupations	8,400,640	6.3	87,000
Arts, design, entertainment, sports, and media occupations	1,758,310	1.3	98,660
Healthcare practitioners and technical occupations	7,755,810	5.8	131,530
Healthcare support occupations	3,924,390	3.0	41,640
Protective service occupations	3,257,690	2.5	79,100
Food preparation and serving related occupations	11,914,590	9.0	30,640
Building and grounds cleaning and maintenance occupations	4,291,410	3.2	39,980
Personal care and service occupations	3,986,740	3.0	38,040
Sales and related occupations	14,068,190	10.6	74,430
Office and administrative support occupations	21,442,800	16.2	55,200
Farming, fishing, and forestry occupations	435,250	0.3	39,040
Construction and extraction occupations	5,088,030	3.8	74,920
Installation, maintenance, and repair occupations	5,138,130	3.9	71,090
Production occupations	8,765,180	6.6	57,080
Transportation and material moving occupations	9,005,120	6.8	56,320

Source: U.S. Bureau of Labor Statistics.

Figure 7 illustrates this relationship for computer and mathematical occupations. Each dot in the figure represents a particular metropolitan statistical area, with the 90–10 ratio for all occupations on the *x*-axis and the percentage employment in computer and mathematical occupations on the *y*-axis. As can be seen, there is a positive relationship between computer and mathematical occupations employment and the 90–10 ratio; that is, areas with more employment in these occupations tend to have higher 90–10 ratios, suggesting greater wage inequality in those areas. Computer and mathematical occupations, which have one of the highest 90th-percentile wages, account for just 2.8 percent of national

employment, but nearly all MSAs with 90–10 ratios greater than 5.0 have higher concentrations of employment in computer and mathematical occupations than the national average. Conversely, most MSAs with below-average 90–10 ratios also have below-average shares of employment in computer and mathematical occupations. The strength of the relationship is also indicated by the  $R^2$  value (0.55) shown in figure 7.<sup>2</sup>

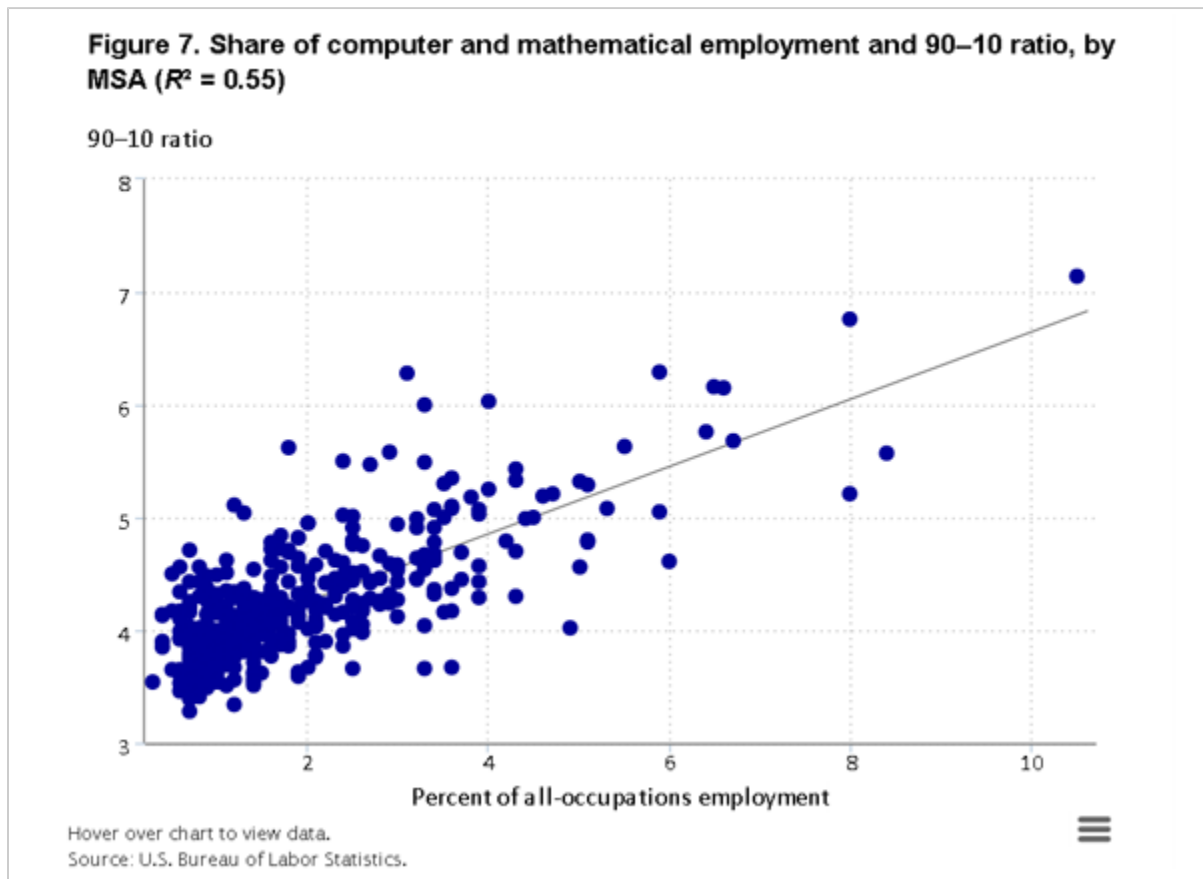


Table 5 shows the  $R^2$  value between employment share and the 90–10 ratio for the eight highest paying major occupation groups. A positive relationship exists for all but one of the occupational groups. Those with relatively high  $R^2$  values include management occupations, business and financial operations occupations, and architecture and engineering occupations.

**Table 5.  $R^2$  values when plotting occupational group share of total employment and 90–10 ratio**

Major occupational group	$R^2$ value	Slope of trend line
Management occupations	0.42	Positive
Business and financial operations occupations	0.42	Positive
Computer and mathematical occupations	0.55	Positive
Architecture and engineering occupations	0.25	Positive
Life, physical, and social science occupations	0.17	Positive
Legal occupations	0.17	Positive
Arts, design, entertainment, sports, and media occupations	0.20	Positive
Healthcare practitioners and technical occupations	0.05	Negative

Source: U.S. Bureau of Labor Statistics.

The one exception is healthcare practitioners and technical occupations, for which the correlation is weak and the trend line is negative, as can be seen in figure 8. Nationally, the 90th-percentile wage for healthcare practitioner and technical occupations is the third-highest among the 22 major groups, and the average share of total employment is 5.8 percent. Nevertheless, there is a weak negative relationship among MSAs with respect to employment share in these occupations and their 90–10 ratios.

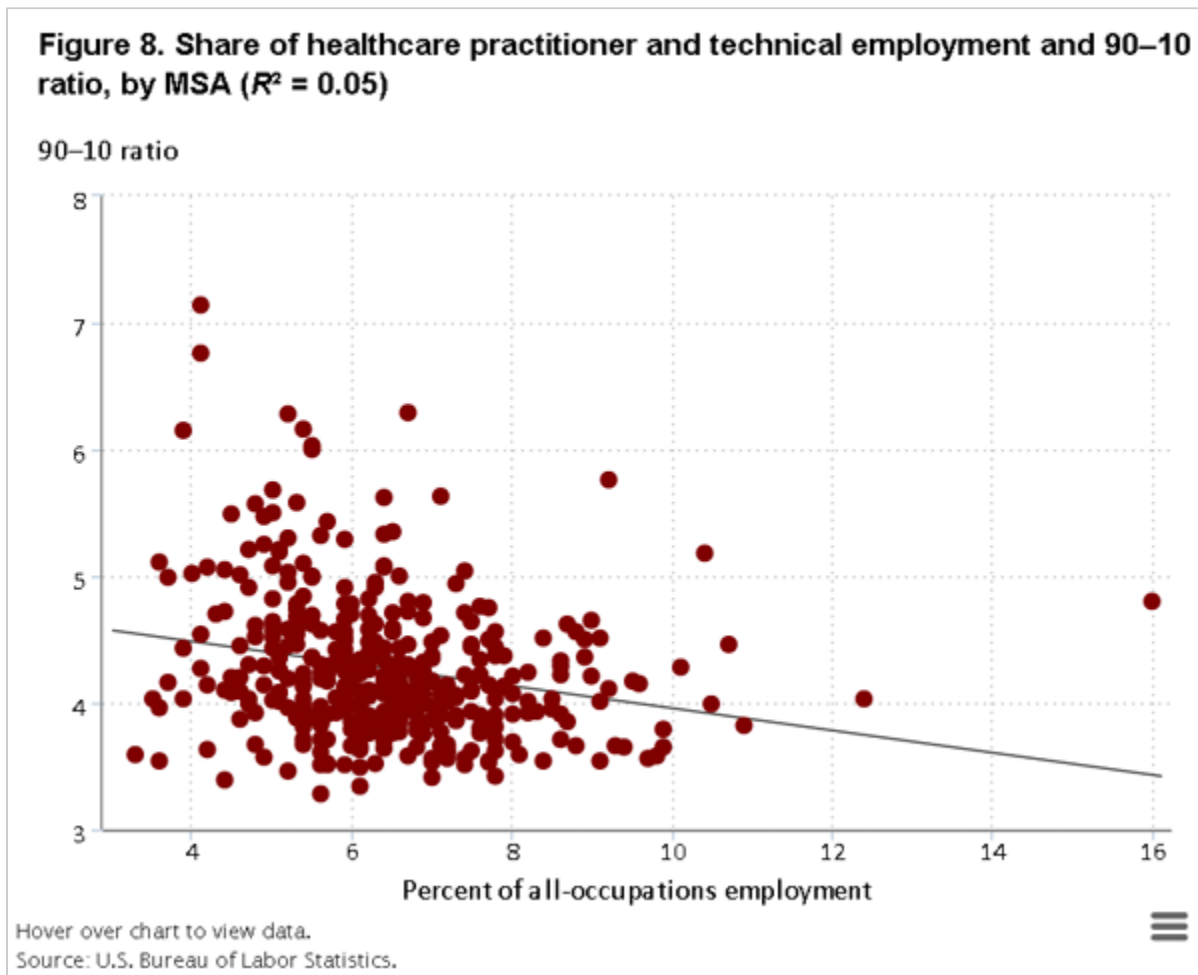


Table 6 shows the 10 MSAs with the largest 90–10 ratios and the employment shares for selected high-paying occupations. Although healthcare practitioners and technical occupations are not shown in this table, 8 of the 10 MSAs have below-average employment in this occupational group. The table shows that the areas with the highest 90–10 ratios tend to have higher-than-average shares of employment in the high-paying occupational groups. All of the areas have above-average employment shares in computer and mathematical occupations and in business and financial occupations. Four of the 10 areas with the highest 90–10 ratios have an above-average percentage of employment in all 7 of the high-paying occupational groups, and 8 of the 10 areas have above-average employment in at least 5 of the high-paying groups.

Some of the areas shown in table 6 have the largest concentrations of employment in high-paying occupational groups in the entire country. Among the 395 metropolitan statistical areas covered in this study, San Jose-Sunnyvale-Santa Clara has the highest percentage of employment in management and computer and mathematical occupations. Washington-Arlington-Alexandria ranks first in the nation in business and financial operations and legal occupations. Huntsville has the highest percentage of employment in the architecture and engineering group. Bridgeport-Stamford-Norwalk ranked second nationally in management occupations, and Durham-Chapel Hill ranked second in life, physical, and social science occupations. There is a clear relationship between employment in high-paying occupations and the 90–10 ratio. Areas with the highest 90–10 ratios tend to have employment concentrated in at least some of the highest paying occupational groups.

**Table 6. Occupational makeup among high-paying occupational groups in MSAs with the highest 90–10 ratios**

Area	90–10 ratio	All-occupations employment	Percent of all-occupations employment						
			Management	Business and financial operations	Computer and mathematical	Architecture and engineering	Life, physical, and social science	Legal	Arts, design, entertainment, sports, and media
United States	4.86	132,588,810	4.9	5.0	2.8	1.8	0.9	0.8	1.3
San Jose-Sunnyvale-Santa Clara, CA	7.14	930,070	8.3	6.9	10.5	5.7	1.1	0.9	1.4
Washington-Arlington-Alexandria, DC-VA-MD-WV	6.76	2,367,240	7.7	10.8	8.0	2.2	1.8	2.7	2.2
Bethesda-Rockville-Frederick, MD	6.29	561,830	7.2	8.2	5.9	2.4	2.8	0.9	1.7
New York-White Plains-Wayne, NY-NJ	6.28	5,242,070	5.6	6.7	3.1	0.9	0.7	1.4	2.8
Huntsville, AL	6.16	210,110	4.5	7.6	6.5	7.6	0.7	0.4	1.0

Area	90–10 ratio	All-occupations employment	Percent of all-occupations employment						
			Management	Business and financial operations	Computer and mathematical	Architecture and engineering	Life, physical, and social science	Legal	Arts, design, entertainment, sports, and media
San Francisco-San Mateo-Redwood City, CA	6.15	1,045,700	7.5	8.4	6.6	1.9	2.0	1.4	2.5
Oakland-Fremont-Hayward, CA	6.03	1,003,860	6.4	6.2	4.0	3.0	1.7	0.7	1.4
Bridgeport-Stamford-Norwalk, CT	6.00	420,170	8.2	7.1	3.3	1.5	0.7	0.8	2.0
Durham-Chapel Hill, NC	5.76	276,580	5.7	6.2	6.4	2.2	3.8	0.6	1.3
Boulder, CO	5.68	163,010	5.0	7.4	6.7	3.9	3.3	0.8	2.2

Source: U.S. Bureau of Labor Statistics.

Table 7 shows the 10 MSAs with the lowest 90–10 ratios. Each of the areas has relatively low levels of employment in the high-paying occupational groups and relatively high levels of employment in the lower paying occupational groups. In addition, these metropolitan areas are small and located in geographic areas where wages are typically lower, further suggesting that size and location are factors in the 90–10 wage ratio.

**Table 7. Occupational makeup among high-paying occupational groups in MSAs with the lowest 90–10 ratios**

Area	90–10 ratio	All-occupations employment	Percent of all-occupations employment						
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Area	90–10 ratio	All- occupations employment	Percent of all-occupations employment						
			Management	Business and financial operations	Computer and math- ematical	Architecture and engineering	Life, physical, and social science	Legal	Arts, design, enter- tainment, sports, and media
Morristown, TN	3.28	43,970	4.1	1.8	0.7	1.3	0.3	*	0.6
Palm Coast, FL	3.34	18,950	2.2	2.6	1.2	0.6	0.2	0.4	0.4
Myrtle Beach-North Myrtle Beach- Conway, SC	3.39	112,720	3.8	2.3	0.7	0.5	0.2	0.6	1.2
Hickory- Lenoir- Morganton, NC	3.41	143,700	3.4	2.3	0.8	0.9	0.4	0.3	0.5
Jonesboro, AR	3.42	50,350	4.2	2.1	0.7	0.6	0.3	0.4	0.5
Danville, VA	3.46	37,000	2.6	2.1	0.6	0.6	0.3	0.4	0.5
St. George, UT	3.49	49,730	4.1	2.5	0.9	0.7	0.6	0.7	1.0
Sioux City, IA-NE-SD	3.51	71,070	3.6	3.2	1.4	0.7	0.4	0.4	0.9
Anniston- Oxford, AL	3.51	43,150	2.7	2.6	0.8	1.5	0.3	0.4	1.0
Deltona- Daytona Beach- Ormond Beach, FL	3.51	152,950	2.3	3.6	1.1	1.0	0.4	0.8	0.9

\* The employment estimate for legal occupations in Morristown, TN, was not published in May 2013.

Source: U.S. Bureau of Labor Statistics.

## Conclusion



This analysis shows that location, size, and occupational composition all play important roles in determining the level of wage inequality within and across U.S. metropolitan areas. Large areas, especially in the Northeast and on the West Coast, typically have higher 90–10 ratios (greater disparity between the highest paid and lowest paid workers), while those in the South and Midwest tend to have lower ratios. In addition, areas with high 90–10 ratios tend to have employment concentrated in high-paying occupations, while those with lower ratios have less concentration in such occupations.

#### Notes

<sup>1</sup> Some areas cannot be compared over time because of changes in the composition of the area and thus are excluded here.

<sup>2</sup> The  $R^2$  value, also known as the *coefficient of determination*, indicates how well the plotted points fit a linear trend line. The  $R^2$  value ranges from 0 to 1. The closer the value is to 1, the better the plots fit the line or the stronger the linear relationship is between the two variables. The  $R^2$  value will always be positive, regardless of whether the slope of the linear trend line is positive or negative.

#### ABOUT THE AUTHOR

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